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Research Article

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Farm Safety Practices in Enugu State, Nigeria

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Abstract The uniqueness of the farming environment and its operations, pre-disposes it to complex potential hazards which calls for concerted efforts.

The decline of emphasis on the relationship between farm operations and associated hazards, safe farm practices as means of averting accidents with targeted focus towards the enhancement of return on investment (ROI), stimulated this work.

Few respondents, who specialized in grain& animal farming, were randomly selected within the study area- Igbo-etiti and Nsukka LGA- Nigeria. Health- Safety- Environment and work performance questionnaire (HSEPQ), work limitation questionnaire and interview schedule were adopted for data collection. Further health statistics obtained from the primary health centers (PHC) were also used. Investigations revealed that about 85% of the respondents had previously suffered from severe wrist/hand injury and lower back pain, which are work-related.

About 55% of the respondents on average could not continue their work schedules because of injuries and illness resulting from their work type. The analysis also showed that under-aged children were the most affected. Marginal losses were also reported due to disaster or emergency situations such as communal crises, Fulani herdsmen, bee attacks, fire, and flood etc.

Also, 85% of the respondents do not use any form of precautionary measures or personal protective equipment (PPE) in the course of executing hazard relative operations.

The Kruskal-Wallis Correlation estimate of the relationship between farmers' knowledge and adoption of precautionary measures by 100 respondents showed Chi-Square value (H) of 13.14, with 2 degrees of freedom (df), and probability (p) of 0.05.

Summing it up, inadequate information or awareness and cost accounted for the major constraints. Thus, information dissemination on farm safety, a subsidized well-implemented farm safety re-orientation programme and farm accident record keeping are recommended.

Keywords Safety, Hazards, Risk, Accident, Prevention

1. Introduction

Above 90% of the efforts at realizing the green revolution has been directed at increasing productivity via improved inputs, machinery, implements etc with less or no emphasis on safety. Hence there are no detailed or comprehensive data to track, control, reduce or minimize losses and tackle the monumental damages, both of human lives, livestock, crops, and the environment. This clearly shows the level of neglect or lip-service to health safety and the environment (HSE).

Farm safety is an indispensable, all-inclusive practice in successful farming. Apart from improving the financial bottom line of a farm business, it enhances the longevity, output or overall performance of each worker.

The farm or Agricultural industry is reported as one of the most dangerous industries. On a global scale, agricultural accidents place a great burden on the economy, resulting in the decline of return on investment (ROI). This impedes workers' efficiency, decreased agricultural output and productivity [1].

Agricultural operations are very wide- broad in scope; the farm environment is not limited to any one particular kind of hazard. The farm possesses a multitude of dangers which pre-disposes man-animal- environment to multifaceted hazards [2].

Farm safety is, therefore, a focal issue for improved agricultural productivity; with the expansion of agricultural technology, there is a growing health concern that agricultural workers will face, in addition to traditional health risks with the new occupational health and safety hazards. Safe farms protect co-workers, children, other family members, and animals from accidental injuries with destructive or devastating capacity.

Most farm accidents are completely preventable. This is attainable if every farm owner or managers act smart by taking a proactive approach to farm safety. The conduct of scheduled inspections also plays an invaluable role. Even in countries where primary health care is well developed, occupational health care in agriculture is often non-existence. Nigerian farmers with little or no knowledge of health and safety as it relates to agriculture cannot afford to neglect the basics of the true key to financial excellence in the industry.

Huge loses (mostly unreported) especially that of human lives are regular in the industry because of lack of controls. There are no disaster management controls. Farmers are the highest victims of the epidemic, and other preventable natural and man-made disasters.

The chapter discusses in detail the various farm hazards, control measures which can be applied to overcome these hazards, Good Agricultural Practices (GAP), importance of Hazard identification, Analysis and Critical Control Points (HIACCP), Recommended safe practices in Ladder usages or handling, lifting procedures and use of personal protective equipments (PPE).

The main objective of the study was to assess the knowledge of farm-related hazards, the implications of same and precautionary practices of farmers in Enugu North Region- Nigeria. The specific objectives of the study include:

1.) Evaluation of the level of safety awareness, adoption of recommended safety standards and correction of any wrong view(s) (attitudes) about the practice.

2.) Exposition of task/ activity related hazards and "ABC" of Achieving a safe work environment- elimination& reduction of potential hazards. Prevention of accidents is achievable if all the workers are acquainted with the safe work principles and guidelines.

3.) Review and recommendation of proactive measures- protective equipment and other precautionary practices, and

4.) Identification of constraints to effective use of protective equipment among farmers.

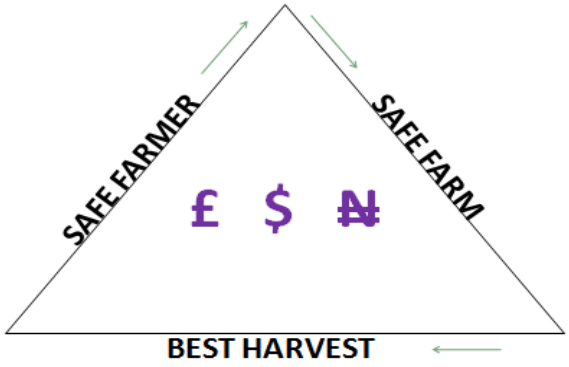

Figure 1

2. Materials and Methods

This work is based on analysis gathered from Uzo- uwani, Nsukka, Igbo Etiti, Igbo-eze North, Igbo-Eze South and Udenu local government of Enugu State- Nigeria. The region has an estimated population of over 2.5million: i.e. 124,480; 209,248; 1,377,001; 259,431; 147,328 and 178,466 respectively (2006 Census). Interestingly, about 30% of the population is primarily engaged in farming.

The peculiar climatic condition of the zone favors cultivation of arable crops like maize, yam, cassava, millet, rice, plantains, palm produce, cashew, etc. a good number of the farmers have sizeable poultry, goat, cattle and pig farms [3].

Health and work performance questionnaire with structured interview schedules, administered to 100 respondents with agriculture as the primary occupation formed the basis of analysis. The respondents were randomly selected from the farming population in the area. Other secondary data were gotten from reports, publications, and the net. Simple statistics such as mean, mode, and like scaling were used for the data analysis.

Figure 2: Map of Enugu State

Map of Enugu State

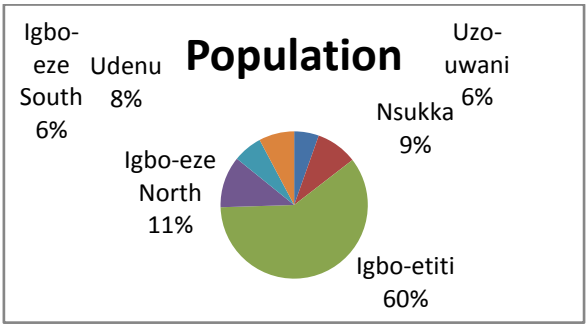

Figure 3

Table 1: Demographic Distribution of farmers (Cereal and animal) in Enugu North Senatorial zone

Demographic characteristics		Frequency	Percentage (%)
Age	Above 45	35	35
	30-45	30	30
	15-30	25	25
	1-15	10	10
Sex	Male	75	75
	Female	25	25
Education	Tertiary	10	10

	Secondary	15	15
	Primary	40	40
	None formal	35	35
Awareness of Hazard	Yes	35	35
	No	55	55
Use of PPE	Yes	25	25
	No	75	75

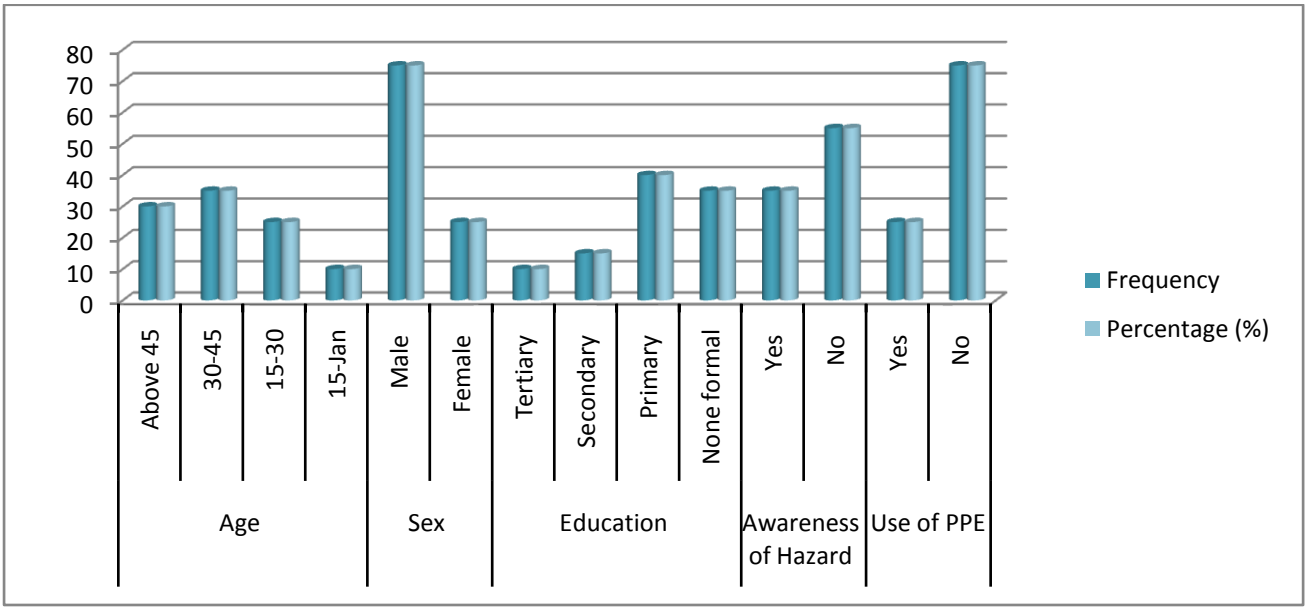

Figure 4: Bar graph showing the distribution of farmers, respective levels of knowledge about hazards and use of PPE

2.1. Health, Risk Assessment

Every occupation has its health hazard which affects the workers in varying degrees. The Nigerian Institute of Safety Professional (NISP) - 2011 posited that "there is an inevitable presence of a hazard in virtually every human endeavor". Hence every action requires just evaluation and assessment of risk limit to ascertain the level of impacts, both on human, the job and the environment.

There is a triangular relationship between hazard, accident, and disease (impact). While the accident is an unplanned and unexpected incident which occurs as a result of exposure to hazardous conditions (situations), a disease is a condition which occurs as a result of exposure to hazardous conditions (situations).

Triangular Relationship between Hazard, Accident, and Disease

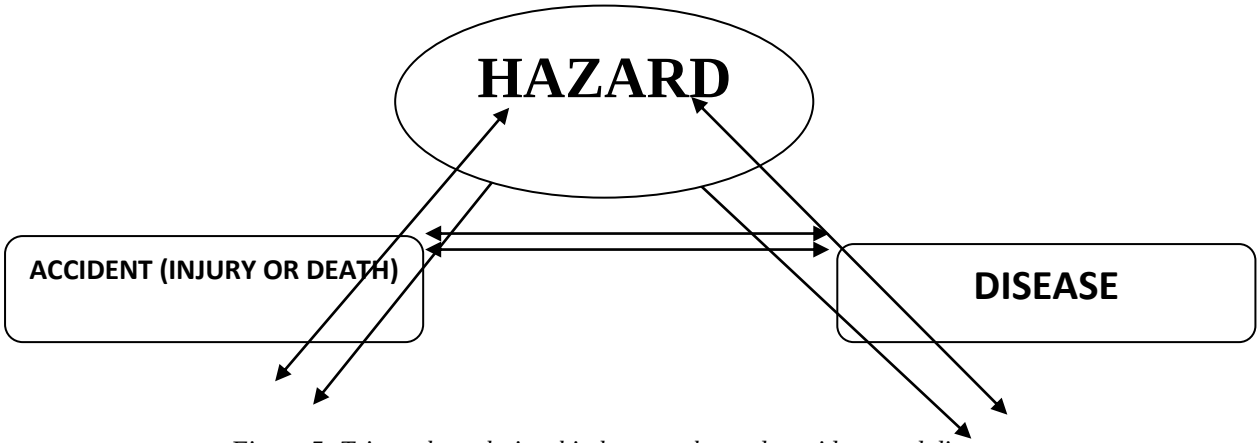

Figure 5: Triangular relationship between hazard, accident, and disease.

Consider a hypothetical case of a farm worker who is exposed to animals e.g. poultry or dog. If he is bitten by an untreated dog, he is likely to contract rabies. In this case, the hazard is 'infection from animal'; the accident is 'dog bite' while the disease - 'rabies' is communicable and makes the victim a potential hazard i.e. a source of transmitting the same disease. The same scenario applies to bird flu in the case of poultry.

2.2. Hazard and Risk

Most times the two terms are used interchangeably but there is a clear difference. Hazard is any biological, chemical, mechanical, environmental or physical agent that is reasonably likely to cause harm or damage to human, animal, crops or the environment in the absence or break down of its control. Risk, on the other hand, is the probability that an exposure to a hazard will result in a negative consequence.

$R \alpha h * et.$ (1)

Where:

R= risk

h= hazard and

e_t = exposure time or limit.

A hazard posse no risk if there is no exposure to that hazard. This deduction is helpful in the design of hazard mitigations or systems to limit the extent of exposures.

$R = Ch\ h\ et\ldots$ (2)

Where:

$\mathbf{C_h}$ = hazard control constant [PPE, Vaccination, Engineering re-design, use of Robot, Reduction of man-hour or exposure limit etc].

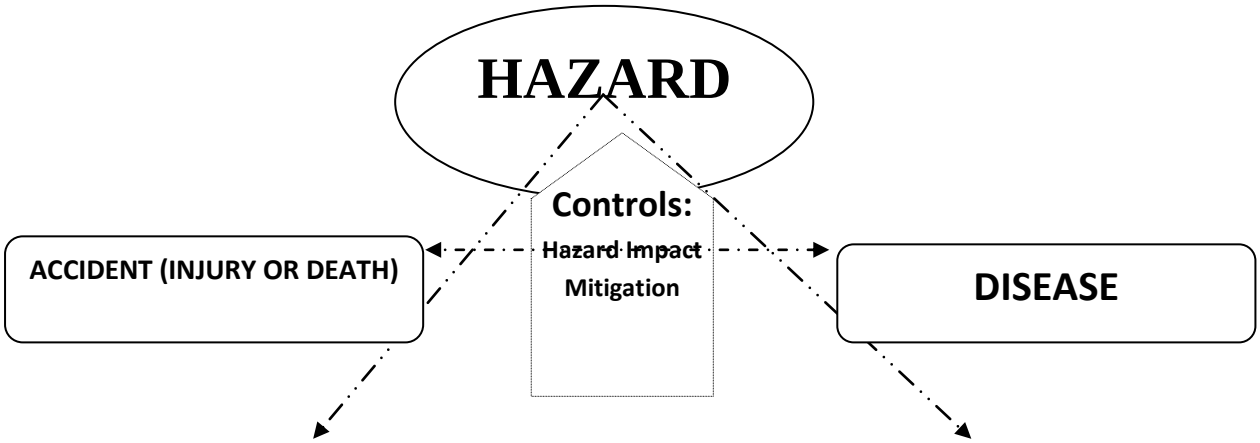

Figure 6: Reviewed- reducing the positive effects of hazard control in the hazard, accident and disease triangle

Controls are difficult to quantify, hence the limitation of the pseudo equation (2). Factors such as behavioral attitudes of manager and workers, errors resulting from machine faults or mechanical breakdown, stress due to the nature of task etc are not measurable (WHO, 1995). Provision or procurement and usage of PPE are affected by behavioral attitudes of farm owners and individual employees.

However, control measures can be estimated and the following approach should serve as an effective means of mitigation of hazard impacts.

Engineering: Re-design of tools and re-assigning of the task as well as reduction of exposure time.

Education: Training to correct negative behavioral attitudes and instill safety culture.

Encouragement: Motivations.

There is also a relationship between the severity of the environmental hazard, probability, and risk [4]. Hazard severity will obviously vary and it is necessary to outline threats posed by hazard. These are:

(a). Hazards to people – death, injury, disease, and stress.

(b). Hazards to goods – property damage and economic loss.

(c). Hazards to the environment – loss of flora and fauna, pollution and loss of amenity.

2.3. Basic Operations and Associated Hazards

There is a strong tie between the adoption of safe farm practices and appreciation and understanding of the relationship between tasks& hazards. An average farm owner or worker is basically concerned about his return hence the concentration of effort at balancing the input-output ratio at the expense of safety which is the fulcrum of the overall success. Table 2 shows the response and level of farmers understanding of associated hazards.

Table 2: Summary of basic farming operations (tasks) and associated hazards

Task & Basic Operations	Type of Hazards	PREVENTIVE MEASURES	Farmers knowledge& assessment of Hazards		
			High%	Low %	No %
The survey, Land preparation: Bush clearing, felling/ cutting,	Sharp objects, piecing, cuts, snake bites, bee stings etc	Use of PPE- Hardhat, Hand glove, Eye goggle, Cover all etc	55	45	0
Bush burning	Burns, human, assets, environmental damage etc	Training, Use of PPE- Fire extinguisher.	50	40	10
Tilling& digging	Injuries due to sharp objects, insect stings, snake bites etc	Use of PPE	69	30	01
Lifting, hoisting	Falling objects, suspended loads	Training, PPE- hard hat, Safety boot etc	45	40	05
Lifting& loading of animals	Animal attacks, slip/ falls	Use of elevator, acceptable lifting techniques, Use of PPE	65	30	05
Grinding, winnowing	Noise, clouds of dust	PPE- Ear, Eye protection	80	15	5
Climbing- Use of Ladders etc	Fall from height	Training, Use PPE, Fall arrestor	90	10	01
Driving	Collision, mechanical failures etc.	Training, Defensive driving; Certified drivers only	80	15	05
Using of Boats, Canoe: Fishing, swimming	Drowning, trauma	Training, Use of PPE- Floater etc.	85	10	5
Feeding of Animal	Animal attacks, infections	Exit root, use PPE	45	45	10
Tractors, Hitching of implements	Rotating parts, flying part, operations: Trapped objects, hand, foot injury etc	Proper awareness, certified operators only; Use PPE- Boot, Hand, foot protection	75	25	0
Fueling, fuel transfer	Fire explosion, eye, hand injury	Use of PPE: Safety goggle, Hand gloves	75	25	10
Painting (Chemicals)	Suffocation, irritation, eye injury	Use of PPE: Google, Hand glove, Cover all; Proper labeling/ storage	25	25	45
Handheld portable tools	Inhalation, noise, hand/ foot injury	Complete PPE	30	25	40
Electrical works- wiring, repairs	Electrocution, shocks, fire	Tag/log out; Proper grounding of the frame, manufacturer's instructions strictly followed	50	25	05
Weed brushing, trimming	Flying objects, hand injury	Safety goggle, Hand gloves, Safety boots	20	65	5
Grain bin/ silos: Drying of grains	Suffocation, Heat, Trauma	Lockout/tag out, use of lifeline, Ventilation, training	25	25	50
Manual handling	Hand injury	Use PPE	25	25	50

Working under the sun	Ultraviolet rays	Use shade, PPE- Hard hat etc.	25	25	50
Working under Bad weather: Rain, Thunderstorm	Thunder& Lightning, Electrocution, Cold etc	Stop work, Switch off auto generators, relocate to a safe building.	60	40	0

2.4. Emergency and Disaster Management on the Farm

Natural disaster or hazard was defined by Burton and Kates [5], as "the element of the physical environment harmful to man and caused by forces extraneous to him".

An emergency is any sudden abnormal, unplanned situation that poses an immediate threat to a person's health, security, property, or environment. Knowing how to assess the signs that make up an emergency will help you know how to handle it. In addition, being well-prepared for an emergency will pay off when it's time to handle any emergency situation.

Respondents randomly selected from the region have a varied and limited understanding of how to respond appropriately to a real emergency. While 45% made reference to orthodox way of calling, creating awareness-ringing- community bell, using town crier which are grossly limited and time consuming, 25% said they depended on God, idols etc, 20% depended on radio and GSM for information and 10% left the option in the hands of security men- the Police, vigilante etc depending on the nature of emergencies.

Table 3: Emergency Situation on the Farm/ Response

Nature of emergency	Appropriate Response{A}	Farmer's Response {B}	Frequencies (%)	
			[A]	[B]
Fire	Call for help, State fire service, Evacuation, use fire Extinguisher(if trained); Install smoke-fire detector, Fire alarm, Siren etc	Call for help, run to a neighbor, create a barrier	35	65
Epidemic (Disease)	Report to Health Centre, Call helpline	Drink local herbs, go to prayer house, consult an oracle etc	40	60
Community clash	Call the Police, Civil defense, Report to Leaders, Ring awareness-Siren, Bells, Set up Security watch	Report to police, mobilize to fight back	30	70
Flooding	Run to safety(evacuation), Create awareness, call State Emergency Response Center	Run/ tell others, report to Police	50	50
Spillage: Oil, Manure etc	Run to a safe location, inform State Fire Service, etc	-	20	80
Emission of poisonous gases	Escape to a safe location, inform others, report to the government, health center	Relocate, tell others	70	30
Exposed Voltage carrying cable (Life wire)	Report to appropriate authorities, Use Caution tape to cordon off the place	Tell others, use red clothes to indicate the spot	50	50
Wild beast (Lion, Leopard, Tiger etc)	Escape to a safe location, inform others, Report to the government	Inform others, raise alarm, Call hunters	15	85
Bee attack	Escape to a safe location(evacuate children& animals), inform others, Use PPE, spray chemical repellants, inform local authorities	Lie down, be still; Wear good clothing, tell others, Trace& burn down its hive.	40	60

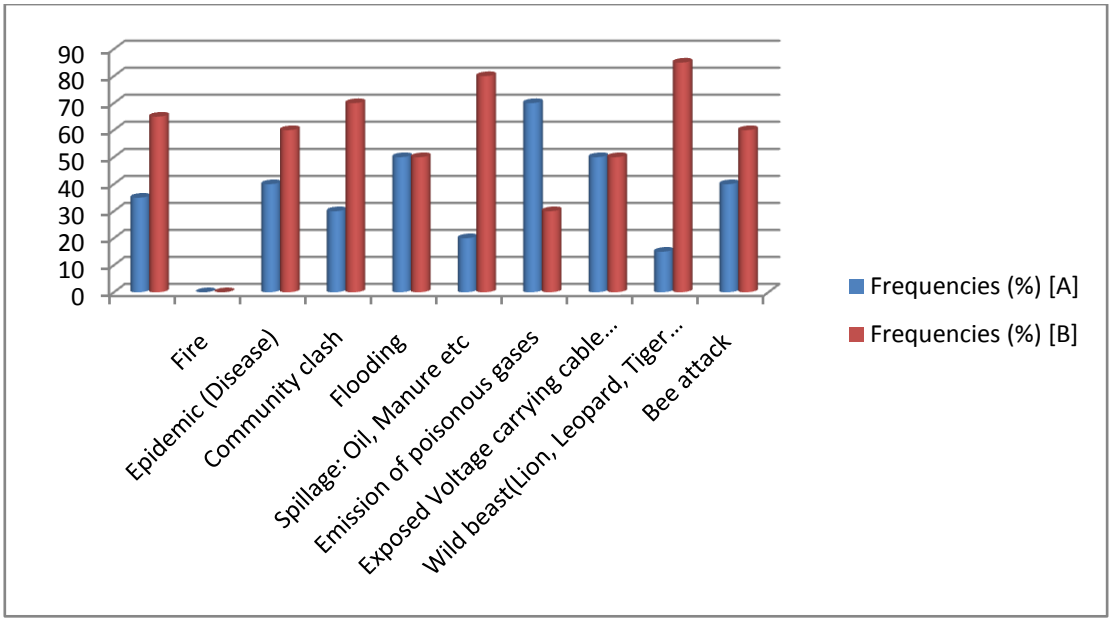

Figure 7: Response to Emergencies on the Farm

3. Results and Discussion

Table 4 shows that 75% of the respondents were male, signifying a male-dominated occupation, with a modal age group of 30 to 45 which denote age range of vigor and strength. About 10% of the respondents had tertiary education, and 40% had primary education as the highest educational level attained, which implies that majority of the group have little or no formal education. This is probably responsible for the lag in the adoption of innovation and modern practices. The study revealed that 60% of the respondents are not aware of any inherent hazard in their day to day activities. This connotes the fact that safety practice as it relates to occupational health and safety is not appreciated in the region; hence, there is a need for an awareness campaign.

Table 4: Evaluation of Farmers use of PPE (Precautionary Measures)

Tasks & Operations	**Farmers knowledge and use of precautionary measures(PPE)**	
	No %	**Yes %**
The survey, Land preparation: Bush clearing, felling/ cutting,	75	25
Bush burning	85	15
Tilling& digging	80	20
Lifting, hoisting	75	25
Lifting& loading of animals	90	10
Grinding, winnowing	55	45
Climbing- Use of Ladders etc	85	15
Driving	90	10
Using of Boats, Canoe: Fishing, swimming	85	15
Feeding of Animal	60	40
Tractors, Hitching of implements	45	55
Fueling, fuel transfer	45	55
Painting, Spraying of Insecticides, Herbicides (Chemicals)	60	40
Carpentry- wood works: use of Handheld portable tools	60	40
Electrical works- wiring, repairs	55	45
Weed brushing, trimming	60	40
Grain bin/ silos: Drying of grains	75	25
Manual handling, Pulling, Pushing activities	75	25
Working under the sun	65	35
Working under Bad weather: Rain, Thunderstorm	60	40

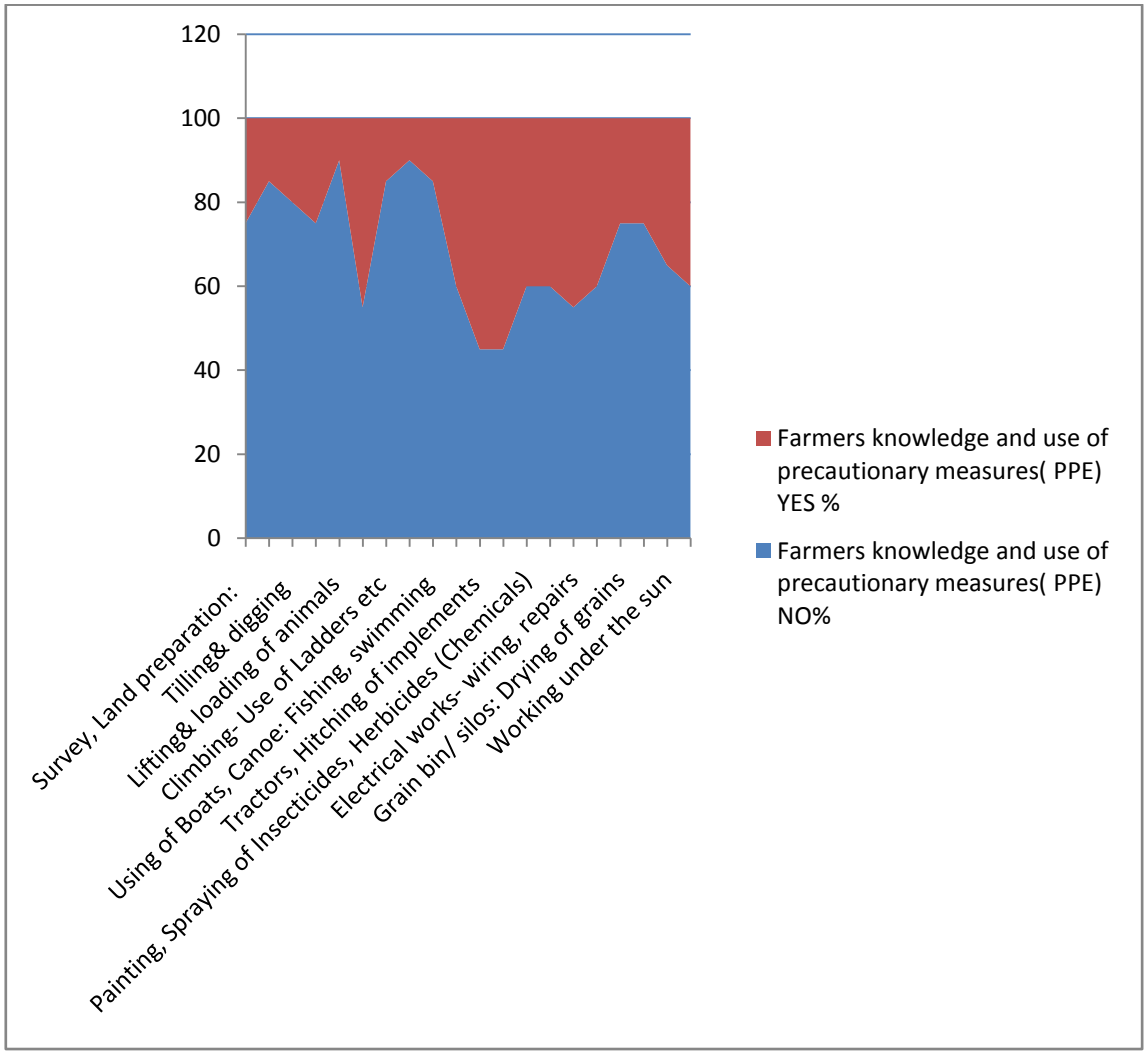

Figure 8: Graph showing the ratio of workers' assessment of work-related hazards and the use of precautionary measure (PPE)

From table 4 and figure 8, above 75% of the respondents do not use any form of personal protective equipment which still reflects the type of attitudes exhibited by managers and workers. It partly shows the level of their orientation and lack of pro-active or preventive measures against accident.

The response further reveals that 80% of the health challenges attended to at the primary health center (PHC) were occupational related and agriculture is prominent. It is also evident why the workers spent a reasonable portion of their income on preventable health challenges. Other likely losses such as the impact of poor chemical handling on the soil, water were not accounted for.

Table 5: {The Kruskal-Wallis test} Correlation estimate of the relationship between farmers' knowledge and adoption of precautionary measures by 100 respondents

Task & relative Hazards	High %	Ranking	Low %	Ranking	No %	Ranking
The survey, Land preparation: Bush clearing, felling/ cutting,	20	17	65	49.5	50	44
Bush burning	25	23.5	45	39	50	44
Tilling& digging	25	23.5	45	39	50	44
Lifting, hoisting	25	23.5	40	34.5	45	39
Lifting& loading of animals	25	23.5	40	34.5	40	34.5
Grinding, winnowing	30	31	40	34.5	10	12

Climbing- Use of Ladders etc	45	39	30	31	10	12
Driving	45	39	30	31	10	12
Using of Boats, Canoe: Fishing, swimming	50	44	25	23.5	5	6
Feeding of Animal	50	44	25	23.5	5	6
Tractors, Hitching of implements	55	47	25	23.5	5	6
Fueling, fuel transfer	60	48	25	23.5	5	6
Painting, Spraying of Insecticides, Herbicides (Chemicals)	65	49.5	25	23.5	5	6
Carpentry- wood works: use of Handheld portable tools	69	51	25	23.5	5	6
Electrical works- wiring, repairs	75	52.5	25	23.5	5	6
Weed brushing, trimming	75	52.5	25	23.5	1	1.5
Grain bin/ silos: Drying of grains	80	54.5	15	15.5	1	1.5
Manual handling, Pulling, Pushing activities	80	54.5	15	15.5	0	0
Working under the sun	85	56	10	12	0	0
Working under Bad weather: Rain, Thunderstorm	90	57	10	12	0	0
N = 20	1,074 Mean:53.7 SD= 22.54	813.5 Rank_ Mean: 40.67 SD = 12.85	585 Mean: 29.25 SD = 13.06	536 Rank_ Mean: 26.8 SD = 9.50	302 Mean: 15.1 SD = 18.76	286.5 Rank Mean: 14.32 SD = 15.95

Chi-Square value (**H) = 13.14, df= 2, P = 0.05**

4. Conclusion/ Recommendation

The study shows that farmers are not adequately prepared to work safe and respond to emergencies. A vast majority of the farmers use combinations of orthodox precautionary practices such as: good housekeeping-making of environment clean of debris, sharp objects, cutting of trees/sticks deep into roots to prevent pointed and sharp edges, making of fireplace around the farm to prevent fire accident, pruning of pointed branches of trees during farm operation, making of signs to indicate where traps are, burning of insect and birds nest to prevent insect stings and spread of diseases. Table 3 shows some of the respondents' approach to prevention of hazard/ accidents.

Major constraints to use of protective equipment (PPE) include discomfort, ignorance or lack of training, and affordability (cost).

Table 4 and Figure 8 shows the level of preparedness of the farmers for the emergency situation on the farm. From the analysis, the farmers are not adequately prepared and there are no regulatory channels of communication or coordination between the farmers and government authorized emergency response agencies. The scattered settlement pattern of the farmers and the orthodox mode of communication calls for concerted effort to re-orientate the rural dwellers about the vast potentials of mobile phones (GSM).

The study, therefore, recommends an established Agric- occupational hazard laws and policies for an inclusive welfare of all parties in the farming business. Employers should be mandated to carter for the health and safety of every employee as well as the derived implication of his day to day operations on the environment. Secondly, machines and well-suited implements should be used for all tasks and operations tagged as most hazardous e.g. GPS and GIS for the Survey of muddy or swampy forests, and zones noted for the presence of dangerous wild beasts; Use of a helicopter for the spray of concentrated chemicals, etc.

Thirdly, the Government should facilitate accessibility of insurance services to all parties involved in the agricultural business. Finally, joint efforts should be intensified to promote the education and training of farmers and farm workers to increase their knowledge and practices of farm-related occupational hazards in the study area.

CONCLUSION

Aknowledgments

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References

[1]. Oluwalogbon, L. A., & Adedeji, A. (2019). Managing Change: Transition from the Traditional Bureaucratic Practices to E-Government. Acta Universitatis Danubius. Administratio, 10(2), 26-41.

[2]. Mustafa, D. (2003). Reinforcing vulnerability? Disaster relief, recovery, and response to the 2001 flood in Rawalpindi, Pakistan. Global Environmental Change Part B: Environmental Hazards, 5(2), 71-82.

[3]. https://en.wikipedia.org/wiki/Nsukka

[4]. https://homepages.uc.edu/~huffwd/Volcanic_HazardRisk/Gravley.pdf

[5]. Burton, I., & Kates, R. W. (1964). The perception of natural hazards in resource management. Natural Resources Journal, 3(3), 412-441.